CLAIMS

What is claimed is:

1. A method for simultaneously determining respective scale factors or alignment angles of sensitive axes in a multi-axis accelerometer device for measuring acceleration, comprising the steps of:

a) mounting a multi-axis accelerometer device on a turntable in a first orientation, the turntable having a tilt angle with respect to a vertical axis defined by a local gravity vector;

b) spinning a multi-axis accelerometer device around an axis of rotation at an angular velocity using the turn table such that the multi-axis accelerometer device experiences a time varying component of the local gravity vector;

c) receiving respective outputs of the multiple axis as the multi-axis accelerometer device experiences the time varying component of the local gravity vector;

d) repeating steps (a), (b) and (c) with the multi-axis accelerometer device mounted in a second orientation; and,

e) repeating steps (a), (b) and (c) with the multi-axis accelerometer device mounted in a third orientation; and,

f) determining respective scale factors or alignment angles of the multiple axes of the accelerometer device by combining the respective received outputs of the accelerometer device with predicted outputs of an ideal accelerometer, the predicted outputs based on the tilt angle of the turntable, the angular velocity of the ideal accelerometer, and the local gravity vector.

2. The method of Claim 1 wherein the angular velocity is constant during the receiving.

3. The method of Claim 1 wherein the multiple-axis accelerometer device is oriented in three orientations while recording data.

4. The method of Claim 1 wherein the time varying components of the local gravity vector are equal to $g*\sin(\theta)*\cos(\phi(t))$ and $g*\sin(\theta)*\sin(\phi(t))$, where θ is the tilt angle, g is the acceleration due to gravity, and ϕ is an angle subtended at the axis of rotation by the accelerometer and the component of gravity in the plane of rotation of the accelerometer.

5. The method of Claim 1 further including the step of filtering the outputs of the multiple axis using respective low pass filters.

6. The method of Claim 5 further including the step of sampling the low pass filtered outputs of the multiple axis using respective analog to digital converters.

7. The method of Claim 6 further including the step of receiving the sampled outputs of the multiple axis and combining the sampled received outputs of the multiple axis with one or more predicted outputs to determine the scale factors of the sensitive axes.

8. The method of Claim 6 further including the step of receiving the sampled outputs of the multiple axis and combining the sampled received

outputs of the multiple axis with one or more predicted outputs to determine the alignment angles of the sensitive axes.

9. The method of Claim 1 further including the steps of:

taking respective Fourier transforms of the received outputs of the multiple axis;

taking the Fourier transform of the predicted outputs of an ideal accelerometer; and

combining the respective Fourier transforms of the received outputs and the predicted output to determine the scale factors or alignment angles of the multiple axis of the multi-axis accelerometer device.

10. A system for simultaneously determining respective scale factors or alignment angles of a multi-axis accelerometer device for measuring acceleration, comprising:

a turn table mechanism configured to mount an accelerometer device having multiple axis for calibration, the turntable having a tilt angle with respect to a vertical axis defined by a local gravity vector, the turntable configured to spin the accelerometer device around an axis of rotation at an angular velocity such that the accelerometer device experiences time varying components of the local gravity vector; and

a processor system coupled to receive respective outputs of the multiple sensitive axes of the accelerometer device, the processor system configured to record the outputs of the accelerometer device as the device experiences the time varying components of the local gravity vector and to determine respective scale factors or alignment angles of the multiple axis of the accelerometer device by combining the logged outputs of the accelerometer

device with a predicted output of an ideal accelerometer, the predicted output based on the tilt angle of the turntable, the angular velocity of the ideal accelerometer and the local gravity vector.

11. The system of Claim 10 wherein the turntable is configured to maintain a constant angular velocity during the recording.

12. The system of Claim 10 wherein the time varying components of the local gravity vector are equal to $g*\sin(\theta)*\cos(\phi(t))$ and $g*\sin(\theta)*\sin(\phi(t))$, where θ is the tilt angle, g is the acceleration due to gravity, and ϕ is an angle subtended at the axis of rotation by the accelerometer and the component of gravity in the plane of rotation of the accelerometer device.

13. The system of Claim 10 further including a low pass filter for filtering the outputs of the accelerometer device.

14. The system of Claim 13 further including an analog to digital converter for sampling the low pass filtered outputs of the accelerometer device.

15. The system of Claim 14, wherein the processor system is further configured to determine the scale factors or alignment angles of the accelerometer device by recording the sampled outputs of the accelerometer device, and by combining the sampled, recorded outputs of the accelerometer device with the predicted output of an ideal accelerometer.

16. The system of Claim 15 wherein the processor system is further configured to determine the scale factors and/or alignment angles of the accelerometer device by:

taking respective Fourier transforms of the recorded outputs of the multiple sensitive axes;

taking the Fourier transform of the predicted outputs of an ideal accelerometer; and

combining the respective Fourier transforms of the recorded outputs and the predicted output to determine the scale factors or alignment angles of the multiple sensitive axes of the multi-axis accelerometer device.

17. A method for simultaneously determining respective scale factors or alignment angles of sensitive axes in a multi-axis accelerometer device for measuring acceleration, comprising the steps of:

a) mounting a multi-axis accelerometer device on a turntable in a first orientation, the turntable having a tilt angle with respect to a vertical axis defined by a local gravity vector;

b) spinning a multi-axis accelerometer device around an axis of rotation at an angular velocity using the turn table such that the multi-axis accelerometer device experiences a time varying component of the local gravity vector;

c) receiving respective outputs of the multiple axis as the multi-axis accelerometer device experiences the time varying component of the local gravity vector;

d) determining respective scale factors or alignment angles of the multiple axes of the accelerometer device by combining the respective received outputs of the accelerometer device with predicted outputs of an ideal

accelerometer, the predicted outputs based on the tilt angle of the turntable, the angular velocity of the ideal accelerometer, and the local gravity vector.

18. The method of Claim 17 further including the step of repeating steps (a), (b) and (c) with the multi-axis accelerometer device mounted in a second orientation.

19. The method of Claim 18 further including the step of repeating steps (a), (b) and (c) with the multi-axis accelerometer device mounted in a third orientation.